

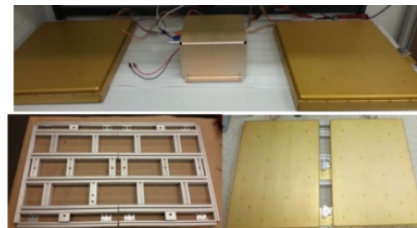
Enhanced Dynamic Load Sensor for ISS (EDLS-ISS), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

Aurora Flight Sciences and the Massachusetts Institute of Technology (MIT) propose to develop a stand-alone 6-DOF load sensing system that collects biomechanical force and moment data while integrated with the Advanced Resistive Exercise Device (ARED) on the International Space Station by adapting and enhancing previously field-tested systems. Our EDLS-ISS system includes a separate base unit tethered to two low-profile sensors, which can be non-invasively mounted on the surface of the ARED to serve as new footplates. The EDLS-ISS is being developed for two reasons: - Operational. Force plates on the ARED will allow crewmembers to verify loading, and to record forces. This device provides a simple, non-invasive solution that measures foot forces and displays this to the astronaut. - Research. Kinematic experiments on the ARED – for example, characterizing limb segment relative motions during a squat – require corresponding force and moment measurements. Our EDLS-ISS system provides three-axis force and three-axis moment measurements for such experiments. By providing a short-term operational solution and a sustainable long-term research solution, EDLS-ISS is an important tool for the spaceflight community. During Phase I, we improved the design of the existing 6-DOF Microgravity Investigation of Crew Reactions in 0-G (MICRO-G) Adapt sensor module, previously developed by Aurora and MIT. These improvements optimized the sensor for use on the ARED: decreasing the overall height of the sensors and separating the electronics into an off-board "base unit", increasing the footprint size to cover most of the surface of the ARED platform, updating the hard drive and electronics, providing a real-time user-feedback display, and developing ARED mounting options. The anticipated result of our Phase II effort will be three complete EDLS-ISS systems, each of which includes a base unit and two sensor units. Two systems will be flight-qualified.

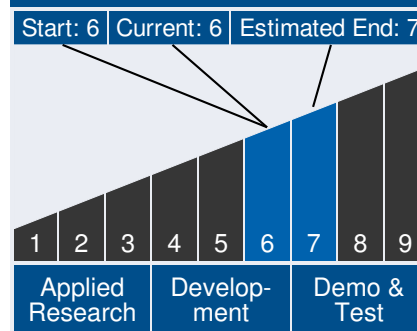


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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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ANTICIPATED BENEFITS

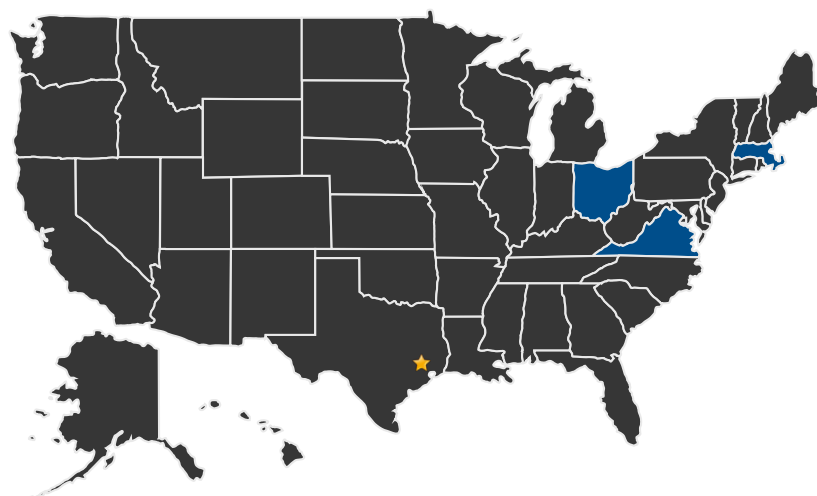
To NASA funded missions:

Potential NASA Commercial Applications: - Provide operational support on-orbit on the ARED and in corresponding ground-based testing - Use with other exercise devices on ISS - Measurement of crewmember push-off forces/moments - Research and simulation of partial gravity activities.

To the commercial space industry:

Potential Non-NASA Commercial Applications: - Commercial medical research - Precision 6-DOF measurements providing posture information for vestibular research - Support gait research - Laboratory testing for the development of prosthetic limbs - Adapted to fit exercise equipment used in high-performance sports training or therapy.

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ Lead Center:
Johnson Space Center

Management Team (cont.)

Project Manager:

- Linda Loerch

Principal Investigator:

- Christopher Krebs

Technology Areas

Primary Technology Area:

Human Health, Life Support, and Habitation Systems (TA 6)

- └ Human Health and Performance (TA 6.3)
 - └ Long-Duration Health (TA 6.3.2)
 - └ Exercise Equipment (TA 6.3.2.4)

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Other Organizations Performing Work:

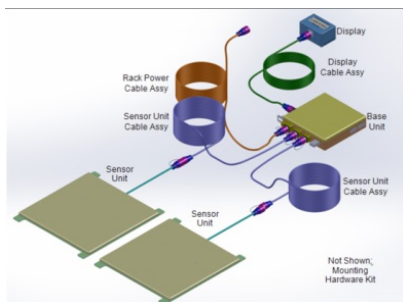
- Aurora Flight Sciences Corporation (Manassas, VA)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23070>)
- Final Summary Chart
 - (<http://techport.nasa.gov:80/file/23806>)

IMAGE GALLERY



*Enhanced Dynamic Load Sensor for
ISS (EDLS-ISS), Phase II*

DETAILS FOR TECHNOLOGY 1

Technology Title

Enhanced Dynamic Load Sensor for ISS (EDLS-ISS)

Potential Applications

- Provide operational support on-orbit on the ARED and in corresponding ground-based testing -
- Use with other exercise devices on ISS - Measurement of crewmember push-off forces/moments -
- Research and simulation of partial gravity activities.